Miguel Costas

Curriculum Vitae, updated February 9, 2021

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Birth date: 11.28.1987

Education

2011–2016 **PhD. in Civil Engineering, area of Continuum Mechanics and Structural Theory**, *School of Civil Engineering*, University of A Coruña.
Doctoral thesis: *Crashworthiness analysis and design optimization of hybrid impact energy absorbers* Research stay at SIMLab (NTNU) during six months, granted by Fundación Barrié.

2005–2010 **MEng. in Civil Engineering (Ingeniero de Caminos, Canales y Puertos)**, *School of Civil Engineering*, University of A Coruña.
Number 11 of 95 in class. Erasmus exchange program at Syddansk Universitet (Odense, Denmark).

2005 **Professional degree in Music**, *Conservatory of Santiago de Compostela*.
Specialization in piano and musical analysis.

Awards

2016 **Extraordinary PhD. award**, *University of A Coruña*.
Yearly award to the best PhD. thesis in the field of Engineering at the University of A Coruña.

2016 **International PhD. mention**, *University of A Coruña*.
Awarded to PhD. projects which include a successful international collaboration and a research stay.

2016 ***Cum laude* PhD.**, *University of A Coruña*.
Awarded to PhD. theses with outstanding contributions, agreed by the committee by secret individual votes.

Work history

2019–Present **Researcher**, *Centre for Advanced Structural Analysis (CASA), NTNU (Trondheim, Norway)*.

2017–2019 **Postdoctoral researcher**, *Centre for Advanced Structural Analysis (CASA), NTNU (Trondheim, Norway)*.

2016 **Postdoctoral researcher**, *Structural Mechanics group, University of A Coruña*.

2011–2015 **RD engineer and PhD candidate**, *Structural Mechanics group, University of A Coruña*.

Summer 2009 **Internship**, *Port Authority of Vilagarcía de Arousa (Puertos del Estado)*.

Teaching experience

2019–Present **Teacher and coordinator of "Materials Mechanics" (TKT4135), master programmes**, *NTNU*.

2015–2018 **Teacher of "Advanced structural analysis" in the Master in Structural and Material Aerospace Engineering**, *School of Civil Engineering, UDC*.

2013–2014 **Assistant in the practical training of the subject "Bridges 1"**, *School of Civil Engineering, UDC*.

Supervision of PhD. theses

2019-2023 **"Behaviour and modelling of multi-layered joints"**, *PhD. candidate Victor André, NTNU*.

Languages

Spanish	Native	
Galician	Native	
English	Full professional proficiency	*Certificate in Advanced English, Cambridge University. 2012.*
Norwegian	Intermediate professional proficiency, level B2	
French	Basic professional proficiency, level B1	
Portuguese	Basic professional proficiency	

Computation skills

FEM Abaqus Standard and Explicit including user material subroutines, LS-DYNA, Ansys, SAP2000, Cosmos/M.

Optimization Experience in structural optimization: DAKOTA and LS-OPT.

CAD Autocad, Solidworks.

Programming Python, Fortran, Bash, LaTeX.

Projects and activities in collaboration with industry

UDC Collaborations from 2011 to 2016:

- [**Airbus**, European project] FP7-AAT-2007-RTD-1. MAAXIMUS: More affordable Aircraft Structure through Extended, Integrated and Mature Numerical Sizing, UE, 03/2008-03/2013. Years 2011-2015. Budget: 370000 €.
- [**Acciona Energy**, national Spanish project] UNCL13-1E-2123. Boundary layer wind tunnel for civil and aeronautical engineering applications. Spanish Ministry of Economy and Competitiveness. Year 2014. Budget: 325000 €.
- [**Acciona Construction**, national Spanish project] DURAPORT. New technologies for the construction of durable port infrastructure. CDTI, program FEDER-INTERCONNECTA, Spanish Ministry of Economy and Competitiveness, ref. 407. Years 2011-2012. Budget: 40000 €.
- [**CTAG**, regional Galician project] 09DPI-011118PR INCITE 2009. Optimum design of automobile structures and components with metallic and composite materials. Regional Counseling of Economy and Industry. Years 2009-2012. Budget: 45000 €.
- [**CTAG**, regional Galician project] 10DPI025CT. Hybrid-Body: structural optimization of a hybrid sistem for frontal impact energy absorption with experimental and numerical validation. Regional Counseling of Economy and Industry. Years 2010-2012. Budget: 46000 €.
- [**Puentes y calzadas**] Seismic design in linear and nonlinear regimes of the new bridge over the river Chiche, in Ecuador. Ref. 443. Year 2013. Budget: 44504.77 €.
- [**Airbus**] Optimization study of rear fuselage. Year 2015. Budget: 25561.26 €.
- [**Airbus**] Junction modeling of nonlinear frequency response of assembled structures. Extension of 2012 activities. Year 2015. Budget: 24200 €.

NTNU Collaborations from 2017 to present:

- [**Hydro Extruded Solutions**] Study of fibrous and recrystallised AA6005-T6 for the development of a through-thickness ductile damage regularisation model for shells. Years 2017-2018.
- [**Toyota Motor Europe**] Effect of pilot holes on the mechanical behaviour of flow-drill screw joints. Years 2017-2019.
- [**Renault**] Flow drill screw joints combining steel and cast aluminium. Years 2018-2019.
- [**Toyota Motor Europe**] Study of hybrid joints with adhesive and flow drill screws. Years 2018-2020.
- [**Hydro Extruded Solutions**] Study of friction stir welds in AA6082-T6 extruded aluminium panels. Years 2019-2020.
- [**Toyota Motor Europe**] Study of the extrusion length produced during the assembly of flow-drill screws. Years 2019-2020.
- [**Hydro Extruded Solutions**] Study of a new high-strength aluminium alloy and development and implementation of an anisotropic through-thickness ductile damage regularisation model for shells. Years 2019-2020.
- [**MX3D** and **Multiconsult**] Study of the material and structural properties of square hollow beams fabricated by wire arc additive manufacturing. Years 2020-2021.
- [**Hydro Extruded Solutions**, **Toyota Motor Europe**, **Audi**, **BMW**, **Honda**, **Airbus**, **Renault**] Calibrations, workshops, seminars and stays related to the industrial implementation of the through-thickness damage regularisation model.

Patents in collaboration with industry

- National Spanish patent no. ES 2-386-269-B1: Hybrid metal-composite system for crash energy absorption. Authors: Alberto Tielas, Isabel Álvarez, Raquel Ledo (Centro Tecnolóxico da Automoción de Galicia, CTAG); Miguel Costas, Luis Esteban Romera (University of A Coruña, UDC). Granted on the 11th of July 2013.

Other RD projects

- [National project] DPI 2013-41893-R. OPTOPAER. Probabilistic topologic and topometric optimization of aeronautical structures in linear and nonlinear regimes. Spanish Ministry of Economy and Competitiveness. Years 2014-2016. Budget: 53240 €.
- [Regional project] GRC2013-056. Group of Competitive Reference. Regional Counseling of Culture, Education and Universities. Years 2013-2016. Budget: 259000 €.

RD fundraising – awarded projects

- [National project] PID2019-108307RB-I00. OPTIFUSE. Reliability-based crashworthiness and damage tolerant optimization of new generation fuselage structures. Spanish Ministry of Science and Innovation. Year 2020. Budget: 15000 €+ PhD contract.
- [National project] DPI2016-76934-R. OPTISAFE. Probabilistic optimization of intact and damaged aeronautical structures under dynamic and impact loading. Spanish Ministry of Economy and Competitiveness. Year 2016. Budget: 111600 €.

Publications

Research articles in JCR journals.

M. Costas, M. Edwards-Mowforth, M. Kristoffersen, F. Teixeira-Dias, V. Brøtan, C.O. Paulsen, and T. Børvik. Ballistic impact resistance of additive manufactured high-strength maraging steel: an experimental study. *Journal of Materials Processing Technology*, 2021 [to be submitted to Materials and Design].

M. Costas, D. Morin, J.K. Sønstabø, and M. Langseth. On the effect of pilot holes on the mechanical behaviour of flow-drill screw joints. Experimental tests and mesoscale numerical simulations. *Journal of Materials Processing Technology*, 2021 [revised manuscript submitted, expecting acceptance].

H. Johannessen, O.H. Johannessen, M. Costas, J.K. Sønstabø, and A.H. CLausen. Experimental and numerical study on the static and dynamic behaviour of notched square hollow sections made of three different types of S355 steel. *Journal of Constructional Steel Research*, 2021 [revised manuscript submitted, expecting acceptance].

J. Paz, M. Costas, J. Delgado, L. Romera, and J. Díaz. Energy absorption of aluminium extrusions filled with cellular materials under axial crushing: Study of the interaction effect. *Applied Sciences*, 10(23), 2020.

A. Muñoz-Ibáñez, J. Delgado-Martín, M. Costas, J. Rabuñal-Dopico, J. Alvarellos-Iglesias, and J. Canal-Vila. Pure Mode I Fracture Toughness Determination in Rocks Using a Pseudo-Compact Tension (pCT) Test Approach. *Rock Mechanics and Rock Engineering*, 53:3267–3285, 2020.

M. Kristoffersen, M. Costas, T. Koenis, V. Brøtan, C.O. Paulsen, and T. Børvik. On the ballistic perforation resistance of additive manufactured AlSi10Mg aluminium plates. *International Journal of Impact Engineering*, 137:103476, 2020.

M. Costas, D. Morin, M. de Lucio, and M. Langseth. Testing and simulation of additively manufactured AlSi10Mg components under quasi-static loading. *European Journal of Mechanics - A/Solids*, 81:103966, 2020.

M. Costas, D. Morin, O.S. Hopperstad, T. Børvik, and M. Langseth. Corrigendum to "A through-thickness damage regularisation scheme for shell elements subjected to severe bending and membrane deformations" [Journal of the Mechanics and Physics of Solids 123 (2019) 190–206]. *Journal of the Mechanics and Physics of Solids*, page 103794, 2019.

M. Costas, D. Morin, O.S. Hopperstad, T. Børvik, and M. Langseth. A through-thickness damage regularisation scheme for shell elements subjected to severe bending and membrane deformations. *Journal of the Mechanics and Physics of Solids*, 123:190 – 206, 2019.

M. Costas, D. Morin, M. Langseth, J. Díaz, and L. Romera. Static crushing of aluminium tubes filled with PET foam and a GFRP skeleton. Numerical modelling and multiobjective optimization. *International Journal of Mechanical Sciences*, 131-132:205 – 217, 2017.

M. Costas, D. Morin, M. Langseth, L. Romera, and J. Díaz. Axial crushing of aluminum extrusions filled with PET foam and GFRP. An experimental investigation. *Thin-Walled Structures*, 99:45–57, 2016.

J Paz, J Díaz, L Romera, and M Costas. Size and shape optimization of aluminum tubes with GFRP honeycomb reinforcements for crashworthy aircraft structures. *Composite Structures*, 133:499–507, 2015.

M. Cid Montoya, M. Costas, J. Díaz, L. E. Romera, and S. Hernández. A multi-objective reliability-based optimization of the crashworthiness of a metallic-GFRP impact absorber using hybrid approximations. *Structural and Multidisciplinary Optimization*, 52(4):827–843, 2015.

J. Paz, J. Díaz, L. Romera, and M. Costas. Crushing analysis and multi-objective crashworthiness optimization of GFRP honeycomb-filled energy absorption devices. *Finite Elements in Analysis and Design*, 91:30 – 39, 2014.

M. Costas, J. Díaz, L. Romera, and S. Hernández. A multi-objective surrogate-based optimization of the crashworthiness of a hybrid impact absorber. *International Journal of Mechanical Sciences*, 88:46–54, 2014.

M. Costas, J. Díaz, L. E. Romera, S. Hernández, and A. Tielas. Static and dynamic axial crushing analysis of car frontal impact hybrid absorbers. *International Journal of Impact Engineering*, 62:166–181, 2013.

Book chapters.

Jacobo Díaz and Miguel Costas. Crashworthiness. In Holm Altenbach and Andreas Öchsner, editors, *Encyclopedia of Continuum Mechanics*, Berlin, Heidelberg, 2019. Springer Berlin Heidelberg.

International conferences.

M. Costas, D. Morin, and M. Langseth. An experimental and numerical study on the lateral crushing of additively manufactured AlSi10Mg boxes. In *European Conference on the Structural Integrity of Additively Manufactured Materials, Trondheim (Norway)*, 2019.

M. Kristoffersen, M. Costas, C.O. Paulsen, T. Koenis, V. Brøtan, and T. Børvik. Experimental and numerical investigations of additively manufactured AlSi10Mg plates subjected to ballistic perforation. In *European Conference on the Structural Integrity of Additively Manufactured Materials, Trondheim (Norway)*, 2019.

M. Costas, D. Morin, and M. Langseth. Modelling and simulation of impact in stiffened aluminium panels using damage regularisation. In *ASIDIC2019, Aerospace Structural Impact Dynamics International Conference, Madrid (Spain)*, 2019.

M. Costas, D. Morin, and M. Langseth. Modelling of steel-aluminium components using structural adhesive and self-piercing rivets. In *12th European LS-DYNA Conference, Koblenz (Germany)*, 2019.

D. Morin, M. Reil, T. Berstad, M. Costas, and M. Langseth. Multi-scale numerical simulations of structural joints with flow-drill screws using a virtual material calibration. In *12th European LS-DYNA Conference, Koblenz (Germany)*, 2019.

D. Morin, T. Berstad, M. Costas, O.S. Hopperstad, and M. Langseth. *MAT_258: A through-thickness regularization scheme for shell element analyses – application to aluminium components. In *12th European LS-DYNA Conference, Koblenz (Germany)*, 2019.

J.K. Holmen, J. Johnsen, M. Costas, D. Morin, T. Berstad, T. Børvik, O.S. Hopperstad, and M. Langseth. Applications of *MAT_258: A through-thickness regularization model for shells. In *Dynamore Nordic Users' Conference 2018, Gothenburg (Sweden)*, 2018.

D. Morin, J.K. Holmen, J. Johnsen, M. Costas, T. Berstad, T. Børvik, O.S. Hopperstad, and M. Langseth. Theoretical aspects of *MAT_258: A through-thickness regularization model for shells. In *Dynamore Nordic Users' Conference 2018, Gothenburg (Sweden)*, 2018.

J. Díaz, L. E. Romera, M. Costas, and J. Paz. Reliability-based crashworthiness optimization of hybrid metal-composite energy absorption devices. In *ICCS19 - 19th International Conference on Composite Structures, Porto (Portugal)*, 2016.

L. Romera, L. Pire, M. Costas, J. Paz, J. Díaz, and S. Hernández. Improvement of crash forces in structures using optimization tools. In *HPSM/OPTI 2016, International Conference on High Performance and Optimum Design of Structures and Materials. Siena (Italy)*, 2016.

M. Costas, J. Díaz, L. E. Romera, D. Morin, and M. Langseth. Experimental characterization and numerical multi-objective optimization of the crashworthiness of aluminum extrusions filled with PET foam and GFRP. In *1st International Conference on Impact Loading of Structures and Materials (ICILSM), Turin (Italy)*, 2016.

J. Díaz, L. E. Romera, J. Paz, and M. Costas. Crashworthiness optimization of metal-composite energy absorption devices. In *ICCS18 - 18th International Conference on Composite Structures, Lisbon (Portugal)*, 2015.

L. Romera, M. Costas, J. Díaz, J. Paz, and S. Hernández. Reduction of the frontal crash peak forces in a car using size optimization tools. In *35th FISITA World Automotive Congress, Maastrich (Netherlands)*, 2014.

J. Díaz, M. Costas, L. Romera, J. Paz, and S. Hernández. Surrogate-based multi-objective optimization of glass-fiber - steel crash absorbers. In *35th FISITA World Automotive Congress, Maastrich (Netherlands)*, 2014.

L. Romera, S. Hernández, M. Costas, A. Balomir, and P. Ouro. Assessment of seismic behaviour of portal bridges with double friction pendulum bearings. In *7th IABSE Symphosium, Madrid (Spain)*, 2014.

L. Romera, J. Paz, M. Costas, J. Díaz, and S. Hernández. Crashworthiness response of honeycomb metallic-GFRP energy abpsortion devices. In *HPSM/OPTI 2014, The 2014 International Conference on High Performance and Optimum Design of Structures and Materials*, 2014.

M. Costas, L. Romera, J. Díaz, S. Hernández, and A. Tielas. Computational and experimental analysis of a hybrid car impact absorber. In *Computational Methods and Experimental Measurements XVI, WIT Press, C.A. Brebbia, G. M. Carlomagno and S. Hernandez (eds.)*, pages 367–378, 2013.

M. Costas, J. Díaz, L. Romera, S. Hernández, and R. Ledo. Influence of welded joints on the crashworthiness response of hybrid structural elements. In *SAE 2013 World Congress and Exhibition, paper 13B-0036/2013-01-0755*, 2013.

International research stays

- Research stay from 1/10/2014 to 1/4/2015 (six months) at the Structural Impact Laboratory (NTNU, Norway) supervised by Prof. Magnus Langseth and Dr. David Morin.

Scientific advisory

- Reviewer in JCR journals *Journal of the Mechanics and Physics of Solids*, *Engineering Fracture Mechanics*, *European Journal of Mechanics A/Solids*, *International Journal of Impact Engineering*, *International Journal of Mechanical Sciences*, *Materials and Design*, *Journal of Reinforced Plastics and Composites*, *Engineering Optimization*, *Computers and Structures*, *Composites Part B* and *Thin-Walled Structures*.
- External advisor, Group of Structural Mechanics, University of A Coruña.
- Opponent in PhD thesis committees at: The University of Edinburgh (2019).

Other information

- Driving license. Car owner.
- Piano teacher and active professional concert pianist.